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Construction and Monitoring of a Mixed-Sediment Mound Offshore of Mobile Bay, Alabama

PURPOSE: This technical note describes the mixed-sediment dredged material mound offshore of the entrance to Mobile Bay, Alabama, and presents the results of monitoring.

BACKGROUND: In nearshore environments, the only dredged material usually allowed for placement is clean sand (with a small percentage of fines) because of concerns that a mixture of sands and a substantial amount of fine sediments (silts and clays) will create excessive turbidity. The turbidity may in turn affect the use of the area by marine organisms for feeding or spawning, and may directly impair the growth of such organisms as sea grasses or corals. The fine materials might also find their way onto beaches, lessening their appeal to the public. Placing mixed sediments nearshore could be beneficial, though, in that it is a way of replenishing often scarce supplies of nearshore sand and may in fact create habitat. Nearshore placement can also lower the cost of dredging if the transport distance is shorter than to other placement areas.

The actual turbidity that might be generated from a nearshore mixed-sediment placement area and its possible adverse environmental effects are unknown. The ability to simulate and predict mixed-sediment erosion and transport numerically would be helpful for this problem in that a variety of climatic scenarios could be studied and the risks and benefits of a given nearshore placement evaluated. A good description of the processes of erosion and transport of mixed sediments is necessary to develop a model for simulations. To add to the existing understanding of mixed-sediment transport processes, the U.S. Army Engineer Research and Development Center (ERDC) and the U.S. Army Engineer District, Mobile, are studying the fate of a mixed-sediment mound placed on the Mobile Bay entrance ebb shoal (Figure 1). Field data are being collected to advance understanding of the geotechnical properties of dredged material before, during, and after dredging, and to provide a quality data set for verification of numerical models under development by the Corps of Engineers.

The Corps of Engineers numerical models for predicting dredged material fate include the Short Term Fate (STFATE) (Johnson 1990), Multiple Dump Fate (MDFATE) (Moritz 1994), and Long Term Fate (LTFATE) (Scheffner et al. 1995) models. These models can be used to predict the fate of dredged material (i.e., where the material moves) during placement and over a given period (up to years) after placement. This study is aimed primarily at providing data for improving the LTFATE model, and to a lesser degree, MDFATE. The LTFATE model is reasonably well verified for sandy placement projects, but it has almost no verification for mixed-sediment materials, or more specifically, cohesive materials. The data set collected through this study provides a unique opportunity to advance understanding of mixed-sediment processes with the ultimate goal being the ability to simulate the fate of nearshore placements more accurately.

PROJECT: Beginning in late October 1998, 267,750 cu m (350,000 cu yd) of cohesive dredged material from the Mobile River in the upper reaches of Mobile Bay near St. Louis Point were placed

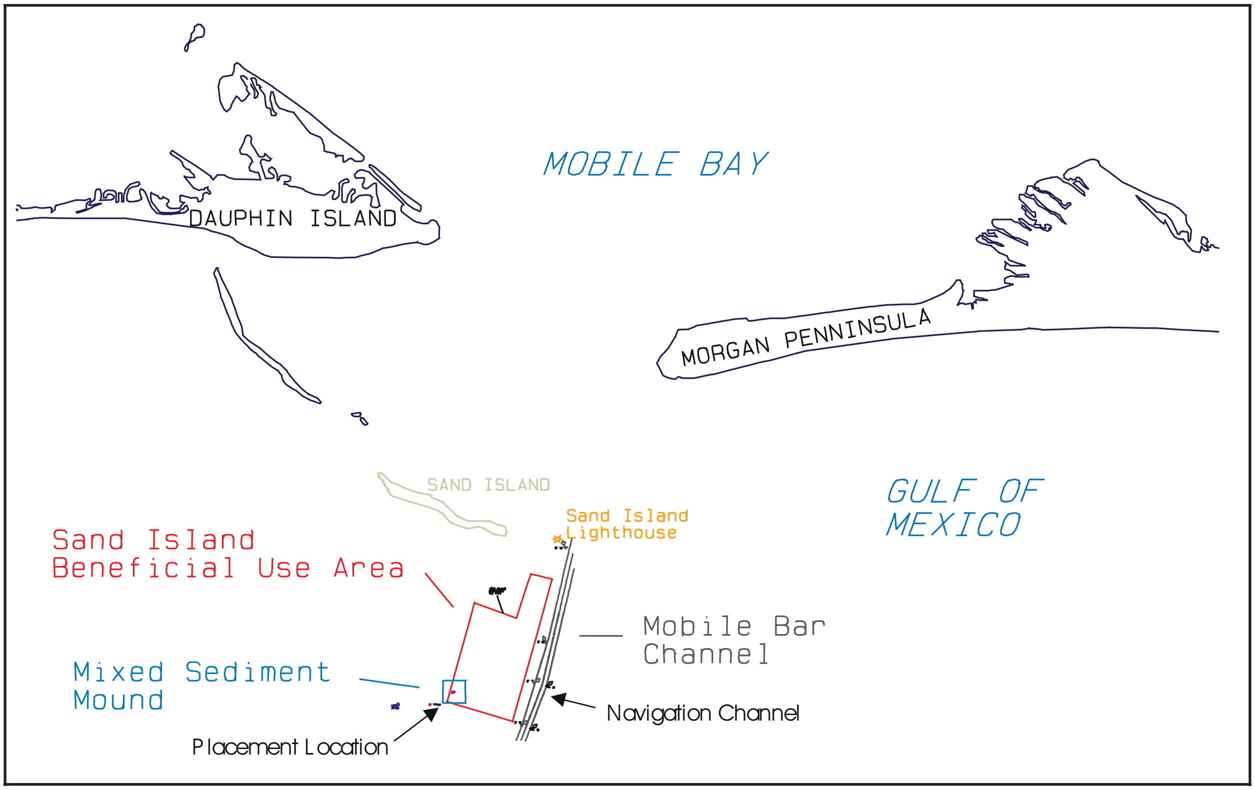

Figure 1. Location of study site offshore of hteentrance to Mobile Bay

in a mound outside the entrance to Mobile Bay. The material had a consistency described loosely as "black mayonnaise." It was removed with a bucket dredge and transported to the placement site using one 4,590-cu-m (6,600-cu-yd) and two 3,060-cu-m (4,000-cu-yd) split-hull barge scows. The placement area was located on the southwestern edge of the entrance ebb shoal (Figure 1) in water depths of between -9 and -10 m (-30 and -33 ft) mean lower low water (mllw). The shallowest depths on the shoal are north of the placement area, around -4.5 m (-15 ft) mllw. The deepest areas, up to -15 m (-50 ft) mllw, are to the east in the dredged navigation channel.

Data were collected prior to, during, and periodically following the dredging and placement operations. Data collection and analyses included sediment characteristics of the material while it was in the barge and after placement in the mound, sediment characteristics of the surrounding seabed before and after placement, and periodic bathymetry of the study area, waves, and currents. Postplacement monitoring at the mound site was planned for 1 to 3 years depending on the changing characteristics of the mound and available long-term funding for the study.

MONITORING

Bathymetry. On 28 September 1998, just prior to the initiation of the project, the eye of Georges, a Category 2 hurricane, made landfall in the vicinity of Ocean Springs and Biloxi, MS, 80 to 121 km (50 to 75 miles) to the west of the study area. The study area was therefore on the more intense right front quadrant of the storm. The western end of Dauphin Island was overwashed. Storm surges were reportedly around 2 m (6.7 ft) (Federal Emergency Management Agency (FEMA) 1999) in the overwash area. Stone et al. (1999) reported waves exceeding 9.9 m (32.8 ft) off the Mississippi/Louisiana coast with a storm surge between 1.9-2.9 m (6.1-9.8 ft). In October, following the hurricane, a multibeam bathymetric survey was taken of the study area and served as the preproject baseline survey. The survey identified a trench in the side of the ebb shoal that formed during the hurricane. The trench was within the limits of the planned placement area, so the placement area was relocated to the west (Figure 2).

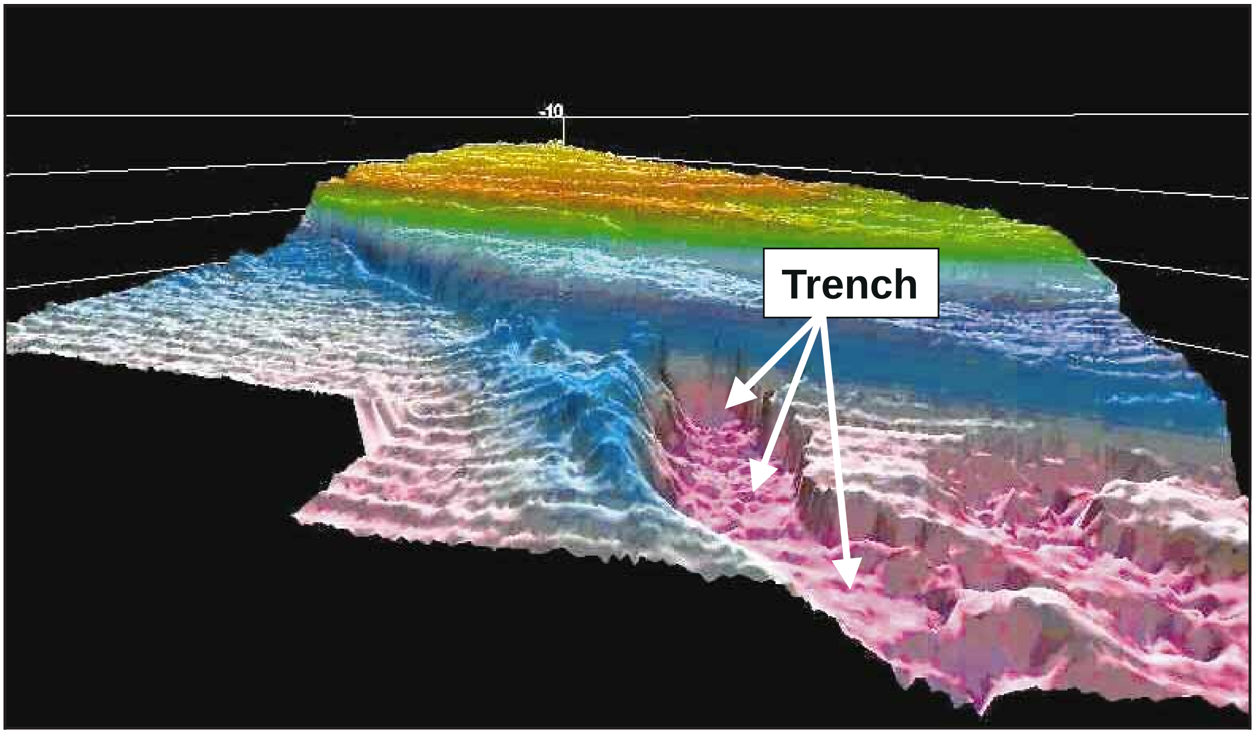

Figure 2. Preplacement bathymetry taken in October 1998

After placement of the dredged material, three additional multibeam bathymetric surveys were collected. The first survey was conducted in December 1998 immediately after the placement operations terminated. This survey covered the same area as the predisposal survey of October 1998. The December survey did not capture the entire trench near the placement site, so the next survey conducted in March 1999 was extended to include most of the trench. The third survey was taken in May 1999 and covered a even larger area (Figure 3). The surveys show that the mound created by the dredged material is on the southwest edge of the ebb shoal and along the -9-m- (-30-ft-) mllw contour. The mound had an irregular footprint, and the highest peaks in the mound surface were at -8 m (-27 ft) mllw.

The placement area was a square, roughly 305 m (1,000 ft) on each side. Figure 4 shows the change in bathymetry before and after placement. The mound is characterized by several peaks showing the difference in depth after placement. A notable flat area is the floor of the trench, which shows that some sediment moved there between surveys. Little change in bathymetry can be detected outside of the placement area. From the surveys, it also appears that the mound has changed little in shape since placement. There has been only slight rounding of the peaks during the study period

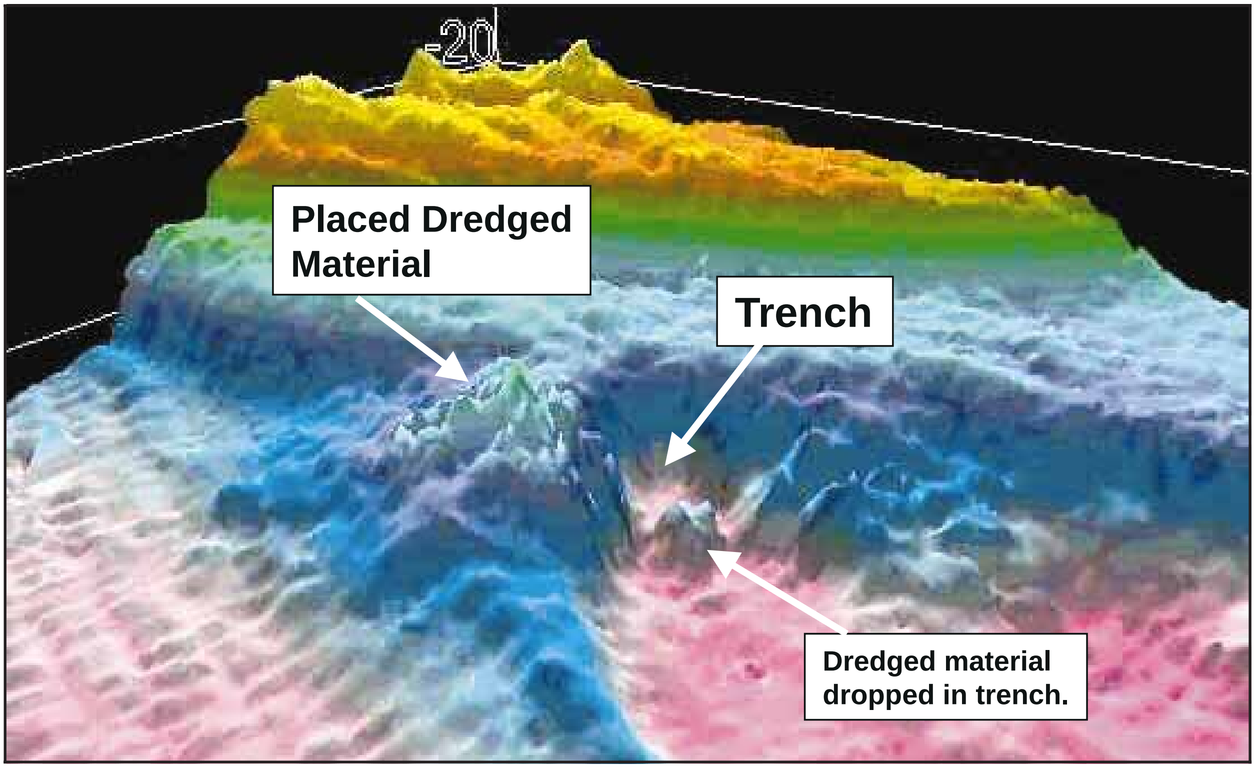

Figure 3. Postplacement bathymetry taken in May 1999

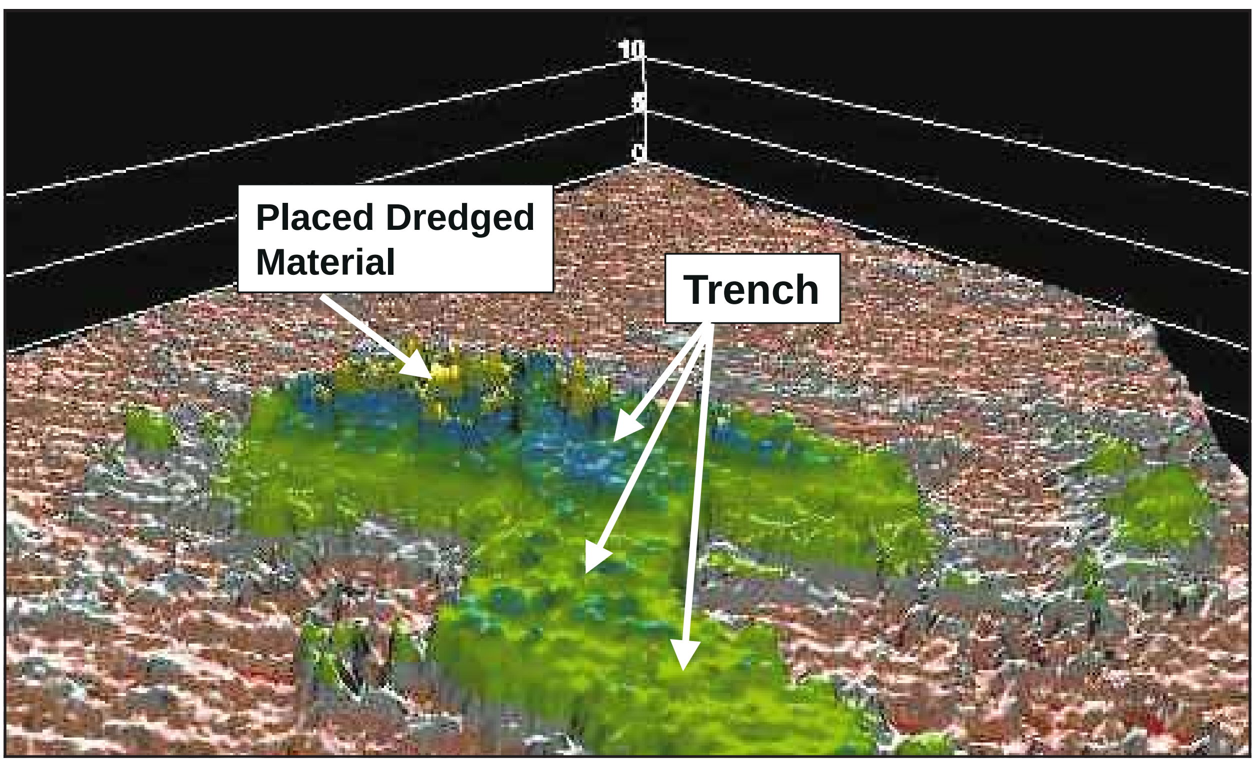

Figure 4. Bathymetric difference between pre- and postplacement surveys. Base of trench (green) has 0.3 m (1 ft) of material. Yellow peaks in dredged material are up to 2 m (7 ft) high

through the May 1999 survey. Less than a foot of change can be detected over most of the study area, which is within the accuracy of the surveys. The cohesiveness of the material appears to be sufficient to maintain the irregular mound morphology. That is, even though the material is fine-grained, it has not formed a mild-sloped mound.

Sediment Samples. Sediment samples were collected from the placement area in October before the dredging operation began. These preplacement sediment samples provide a description of the native sediments of the ebb shoal. Fifty-four samples were collected in a square grid pattern within and surrounding the placement area as indicated in Figure 5. Forty samples were collected on 20 October 1998. A single sample identified as “Probe” was taken on 21 October 1998. Thirteen additional samples were collected on 26 October 1998 to the west to provide better coverage around the placement site. The samples were collected with a 1,000-g bucket dredge, though only 20 g of sediments per sample was needed for analysis.

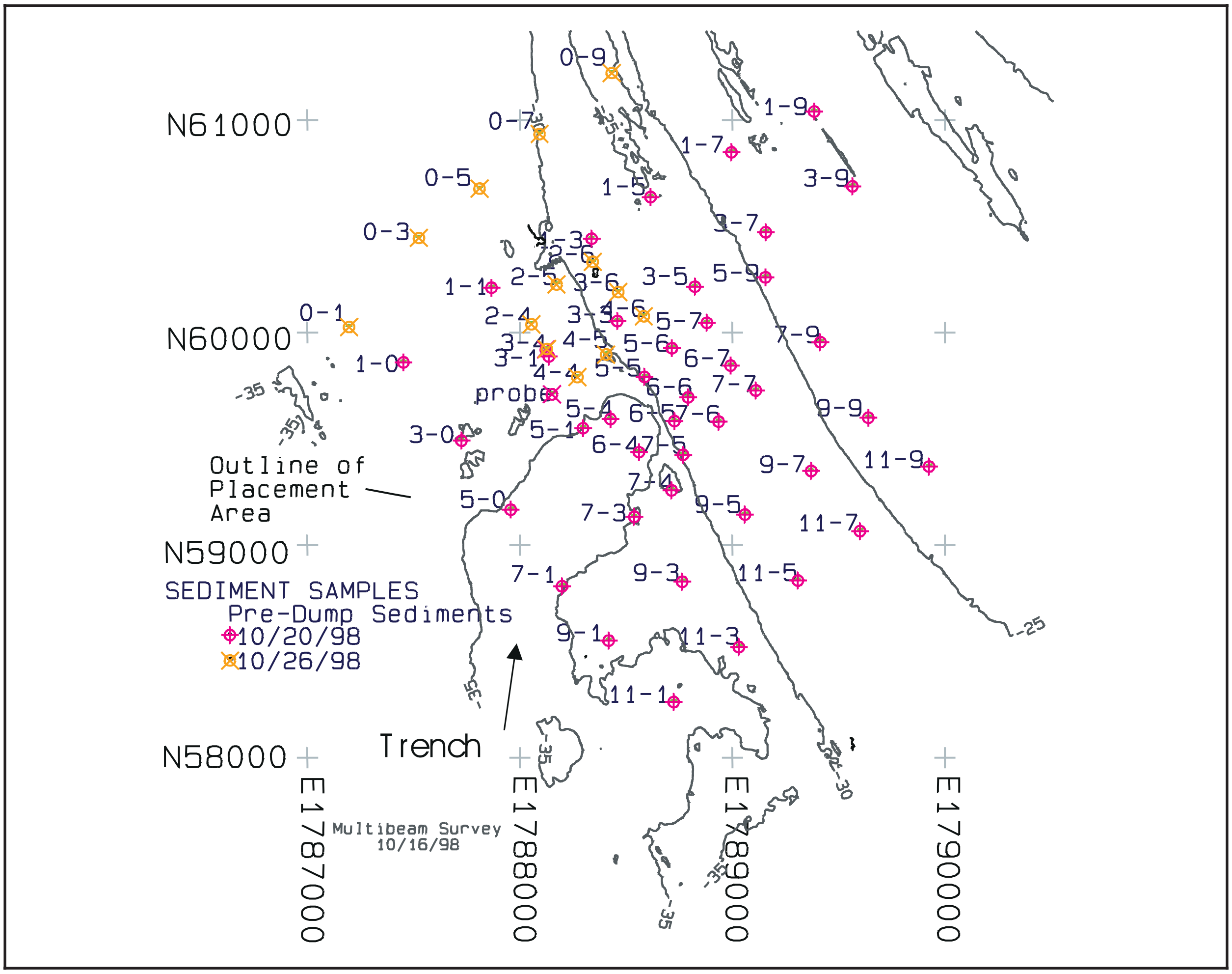

Figure 5. Location of preplacement sediment samples

Three sediment samples were collected at different times during the dredging operation at the dredge site in the Mobile River to characterize the in situ dredged material. These samples were collected from the clamshell bucket just prior to disposing into the barge. After the dredged material was placed in the study area, five samples of the placed material were collected on 2 December 1998. The characteristics of the native ebb-shoal sediments and the placed dredged material were compared.

Grain-size analysis was accomplished using two techniques. The sediment samples containing clean, sand-sized material were analyzed by standard sieve techniques. Because some of the samples contained fine material, they were also analyzed with a Coulter LS1000 laser particle counter for grain-size distribution. The laser particle counter measured grain sizes from coarse sand to clay. Each sample was measured three times. The two methods of analysis (standard sieve and the laser particle counter) are not directly comparable because the sieve method measures weight-percent based on size that passes a given sieve, while the laser particle counter measures a percent volume of a particle size. Comparing the sieve and laser data sets for the sand size samples indicated that the laser particle counter produced coarser means than the sieve method. The grain-size statistics for the predisposal native sand size samples analyzed by sieve method are shown in Table 1 and all samples (including the fines) analyzed by the laser particle counter are shown in Table 2. For consistency, the mean grain sizes derived by laser particle counter will be used in the analysis since they are available for all samples and are comparable with one another.

Table 1
Sieve results for native ebb shoal samples

SAMPLE #	EASTING	NORTHING	MEAN-phi	SORTING-phi	SKEWNESS-phi	KERTOSIS-phi	MEAN-mm	Depth (ft - mlw)
0-3	1787524.62	60445.27	2.31	0.59	-0.93	6.3	0.2	-33.5
0-5	1787810.2	60677.21	2.36	0.49	-1.18	7.96	0.19	-32.1
0-7	1788092.75	60934.01	2.28	0.48	-1.44	10	0.21	-29.7
0-9	1788432.32	61220.84	2.12	0.43	-0.86	7.12	0.23	-24.6
1-3	1788337.84	60441.8	2.26	0.41	-1.09	9.85	0.21	-27
1-7	1788995.61	60847.67	2.17	0.37	-0.17	5.49	0.22	-22
1-9	1798385.27	61039.7	1.95	0.49	-0.95	7.05	0.26	-20.7
2-5	1788172.95	60226.23	2.3	0.47	-1.68	14.33	0.2	-30.9
2-6	1788342.56	60332.67	2.31	0.43	-0.92	8.31	0.2	-27.7
3-0	1787725.25	59492	2.29	0.56	-0.85	6.64	0.21	-30.5
3-3	1788458.62	60054.48	2.27	0.43	-0.88	8.16	0.21	-28.8
3-6	1788462.99	60190.84	2.25	0.43	-1.02	7.75	0.21	-27.1
3-7	1789157.55	60472.27	2.14	0.45	-1.57	10.27	0.23	-20.9
3-9	1789565.24	60687.85	2.16	0.39	-0.51	5.05	0.22	-20.8
PROBE	1788151.39	59709.59	2.11	0.53	-0.93	5.41	0.23	-30.6
4-4	1788270.85	59790.53	2.09	0.51	-0.4	4.89	0.23	-31.3
4-5	1788405.69	59896.53	2.31	0.5	-0.6	4.77	0.2	-30
4-6	1788583.04	60076.89	2.24	0.45	-1.05	7.77	0.21	-26.5
5-5	1788586.36	59791.37	2.23	0.44	-1.05	7.05	0.21	-29.2
5-6	1788715.55	59926.51	2.25	0.48	-1.72	10.5	0.21	-26.6
5-9	1789155.96	60259.51	2.13	0.43	-1.43	9.49	0.23	-23.2
6-5	1788727.53	59583.97	2.27	0.44	-1.35	11.41	0.21	-28.7
6-6	1788791.83	59695.79	2.26	0.44	-1.03	7.96	0.21	-27
6-7	1788991.67	59844.51	2.33	0.43	-1.12	9.6	0.2	-26.9
7-5	1788768.35	59424.35	2.3	0.43	-1.08	8.91	0.2	-29.8
7-6	1788935.57	59581.12	2.28	0.43	-1.24	12.12	0.21	-26.9
7-9	1789414.12	59955.15	2.18	0.41	-0.81	6.83	0.22	-21.2
9-1	1788417.93	58551.42	2.25	0.61	-0.84	4.73	0.21	-33.8
9-5	1789059.29	59144.07	2.31	0.43	-1.46	11.3	0.2	-27.3
9-9	1789640.42	59599.43	2.13	0.44	-1.04	6.98	0.23	-22
11-9	1789925.81	59369.5	2.09	0.44	-0.79	5.49	0.24	-22.4

Table 2
Native ebb shoal sediment analysis results based on laser particle counter

SAMPLE #	EASTING	NORTHING	Depth (ft-mlw)	DATE	Mean-mm	Mean-phi
0-1	1787196.47	60026.25	-34.2	10/26/98	0.276	1.86
0-3	1787524.62	60445.27	-33.5	10/26/98	0.308	1.7
0-5	1787810.2	60677.21	-32.1	10/26/98	0.288	1.8
0-7	1788092.75	60934.01	-29.7	10/26/98	0.303	1.75
0-9	1788432.32	61220.84	-24.6	10/26/98	0.321	1.64
1-0	1787451.62	59859.49	-33.8	10/20/98	0.296	1.76
1-1	1787866.33	60210.8	-31.2	10/20/98	0.253	1.98
1-3	1788337.84	60441.8	-27	10/20/98	0.296	1.76
1-5	1788615.33	60637.42	-25.8	10/20/98	0.275	1.86
1-7	1788995.61	60847.67	-22	10/20/98	0.306	1.71
1-9	1798385.27	61039.7	-20.7	10/20/98	0.371	1.43
2-4	1788054.03	60038.92	-31.7	10/26/98	0.312	1.68
2-5	1788172.95	60226.23	-30.9	10/26/98	0.298	1.75
2-6	1788342.56	60332.67	-27.7	10/26/98	0.291	1.78
3-0	1787725.25	59492	-30.5	10/20/98	0.31	1.69
3-1	1788136.49	59886.97	-31.5	10/20/98	0.048	4.39
3-3	1788458.62	60054.48	-28.8	10/20/98	0.299	1.74
3-4	1788127.19	59922.78	-31.6	10/26/98	0.147	2.76
3-5	1788823.91	60215.71	-26.2	10/20/98	0.303	1.72
3-6	1788462.99	60190.84	-27.1	10/26/98	0.305	1.71
3-7	1789157.55	60472.27	-20.9	10/20/98	0.313	1.68
3-9	1789565.24	60687.85	-20.8	10/20/98	0.309	1.69
PROBE	1788151.39	59709.59	-30.6	10/21/98	0.332	1.59
4-4	1788270.85	59790.53	-31.3	10/26/98	0.3515	1.51
4-5	1788405.69	59896.53	-30	10/26/98	0.302	1.73
4-6	1788583.04	60076.89	-26.5	10/26/98	0.3044	1.72
5-0	1787956.43	59167.16	-36.5	10/20/98	0.023	5.44
5-1	1788297.04	59550.36	-35.3	10/20/98	0.248	2.01
5-4	1788426.3	59593.36	-37.1	10/20/98	0.222	2.17
5-5	1788586.36	59791.37	-29.2	10/20/98	0.297	1.75
5-6	1788715.55	59926.51	-26.6	10/20/98	0.29	1.79
5-7	1788879.95	60046.31	-26.7	10/20/98	0.293	1.77
5-9	1789155.96	60259.51	-23.2	10/20/98	0.306	1.71
6-4	1788560.36	59437.51	-37.5	10/20/98	0.032	4.97
6-5	1788727.53	59583.97	-28.7	10/20/98	0.295	1.76
6-6	1788791.83	59695.79	-27	10/20/98	0.297	1.75
6-7	1788991.67	59844.51	-26.9	10/20/98	0.291	1.78
7-1	1788198.5	58806.5	-36.8	10/20/98	0.308	1.7
7-3	1788538.3	59133.94	-36.5	10/20/98	0.19	2.39
7-4	1788713.79	59257.93	-34.9	10/20/98	0.163	2.62
7-5	1788768.35	59424.35	-29.8	10/20/98	0.296	1.76
7-6	1788935.57	59581.12	-26.9	10/20/98	0.301	1.73
7-7	1789110.65	59727.54	-27.3	10/20/98	0.072	3.79
7-9	1789414.12	59955.15	-21.2	10/20/98	0.317	1.66
9-1	1788417.93	58551.42	-33.8	10/20/98	0.334	1.58
9-3	1788764.32	58827.92	-33.5	10/20/98	0.249	2.01
9-5	1789059.29	59144.07	-27.3	10/20/98	0.286	1.81
9-7	1789371.07	59349.22	-27.7	10/20/98	0.116	3.11
9-9	1789640.42	59599.43	-22	10/20/98	0.322	1.63
11-1	1788724.1	58262.58	-37	10/20/98	0.023	5.44
11-3	1789030.9	58521.09	-32.8	10/20/98	0.269	1.89
11-5	1789308.46	58833.69	-28.3	10/20/98	0.089	3.48
11-7	1789601.43	59066.21	-28	10/20/98	0.2805	1.83
11-9	1789925.81	59369.5	-22.4	10/20/98	0.336	1.57

Sediment Analysis Results. The distribution of the native sediments indicates a trend of coarser clean quartz sand on the shallower parts of the ebb shoal and finer sediments in the deeper parts of the ebb shoal. The coarsest material (means of 0.37 to 0.30 mm) is found on the upper terraces between -6 and -8 m (-20 and -25 ft) mllw. On the terrace between -8 and -9 m (-25 and -30 ft) mllw, the bulk of the samples have means between 0.3 to 0.28 mm, all in the medium sand size range. Between -9 and -11 m (-30 and -35 ft) mllw, the bulk of the samples have a mean between 0.35 and 0.25 mm. Finer material was found in localized holes. Below -11 m (-35 ft) mllw, on the edges of the trench, medium to fine sands were found, and in the trench basin silt was found.

Dredged Material in Placement Site. The three samples collected at the dredging site from the clamshell were analyzed. These samples had mean grain sizes in the very fine sand to silt range between 0.099 and 0.048 mm. The five samples of the dredged material taken from the placement area were also analyzed. Table 3 gives the grain-size means of the samples. The means are similar to those of the samples collected from the clamshell dredge. All are in the silt range between 0.058 and 0.040 mm. These means were for the most part slightly finer than the native silt material, except for the native silts in the trench. Figure 6 compares the grain size frequency curves of the placed dredge material to those of the native sediments.

Table 3
In situ river and postplacement dredged material sediment analysis results, Laser Particle Counter

SAMPLE #	EASTING	NORTHING	DATE	Mean-mm	Mean-phi
Barge 1	1798480.000	264529.00	10/21/98	0.055	4.17
Barge2	1798376.907	263488.57	11/12/98	0.099	3.33
Barge3	1798546.33	261896.82	11/24/98	0.048	4.39
PD1PROBE	1788147.67	59700.22	12/02/98	0.057	4.13
PD2NE	1788346.74	59799.24	12/02/98	0.047	4.41
PD3NW	1788266.43	59854.80	12/02/98	0.051	4.30
PD4SW	1788068.84	59736.38	12/02/98	0.040	4.66
PD5SE	1788136.81	59636.02	12/02/98	0.058	4.12

The five samples of the placed dredged material were further tested for their geotechnical characteristics (Table 4). Testing included initial water content/bulk-density, specific gravity, grain-size distribution, Atterberg limits and classification, consolidation, and laboratory vane shear strength. The samples varied little from one to another. The initial bulk densities of the material ranged from 1,419 to 1,571 kg/cu m (88.6 to 98.1 lb/cu ft). The maximum void ratios determined at the time of testing were between 5.1 and 6.8, values that are typical for recently deposited sediments and/or mechanically dredged material. All samples were classified as gray sandy clay (CH). Consolidation tests on the samples showed all of the samples had similar compressibility curves.

Table 4
Geotechnical characteristics of the placed dredged material

Characteristics	Sample 5	Sample 3	Sample 4	Sample 1	Sample 2
Initial density	92.69	98.06	94.45	93.36	88.59
Maximum void ratio	5.43	6.28	6.03	6.98	5.19
Classification	CH	CH	CH	CH	CH
Liquid limit	71	69	69	65	62
Plastic limit	25	26	24	25	24
Plasticity Index	46	43	45	40	38
Specific Gravity	2.76	2.65	2.73	2.74	2.65
% sand	15	27	20	27	21
% silt and clay	85	73	80	73	79

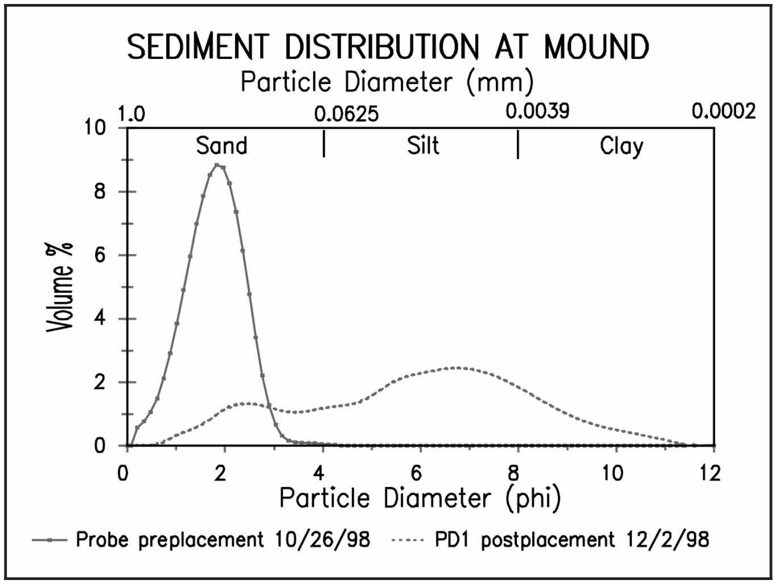

Figure 6. Comparison of grain-size distribution for sandy native ebb shoal sediments and the finer dredge material sediiments

Current Velocity and Direction Measurements. A 1,500-kHz SonTek Acoustic Doppler Profiler (ADP) was installed in the study area prior to placement of the dredged material to obtain current velocity and direction. The ADP was mounted in a stable housing and placed on the seabed. A water level recorder in a subsurface case recorded the absolute pressure of the water column above the instrument from which waves and water levels were derived. The pressure was corrected for barometric pressure via another pressure gauge located to record atmospheric pressure changes. The water level gauge sampled at 1 Hz for 1,024 sec every hour. The barometer sampled pressures over 1 min and formed an average, which was then used to correct the water level gauge pressures. Each recorder stored the information on a data logger located in the waterproof subsurface unit. The velocity and water level data were retrieved every 4 to 6 weeks.

Water level and wave data were collected almost continuously for the period from the end of October 1998 through July 1999. Tidal currents were recorded during that period as well, but problems with sediment accumulation on the gauge limited the amount of useful data. The data are summarized in the following paragraphs.

The Wave Information Study (WIS) (Hubertz and Brooks 1989) hindcast summary data for Station 27 in the Gulf of Mexico, which is 24-32 km (15-20 miles) south of the study area, are presented in Table 5 (after Hubertz and Brooks 1989). The table provides the monthly maximum significant wave height hindcast for each year between 1956 and 1975 and the means of significant wave height for each month (averaged over the 20-year hindcast record). The significant wave height maximums and means measured by the wave gauge and analyzed for this period are also provided. The measured data tend to be lower than the hindcast data. One likely reason for this is that the WIS station is at 24-32 km (15-20 miles) south of the study site. Waves from the north then would be larger at Station 27 than at the study site because of the longer fetch to the WIS station. Waves from the north occur less frequently, as the dominant wave direction is from the southeast. Another likely reason is simply that the weather during this period was mild. The average peak periods of the measured waves were between 5 and 6 sec, which is consistent with the hindcast data.

Tidal and meteorologically induced currents were measured during the study period. Only the months of December, January, and March provided useful data. Table 6 provides the summary data regarding the currents for those months. The currents contain a north-south diurnal oscillation as water moves in and out of Mobile Bay.

Table 5
Measurements & WIS hindcast comparisons

WIS Significant Wave Height Maximums, m												
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1956	2.2	2.6	2.4	2.9	1.8	2.2	1.3	1.4	2.5	2.1	2.0	2.2
1957	2.2	2.2	2.2	3.4	2.0	2.9	1.1	2.4	3.3	2.7	2.9	2.9
1958	3.3	2.7	3.1	2.4	1.8	1.7	1.3	1.4	2.5	2.3	2.0	2.9
1959	4.2	2.0	3.1	1.7	2.0	1.8	1.5	1.3	2.4	2.4	2.2	2.4
1960	2.3	3.6	2.1	1.9	2.2	1.6	1.0	1.6	2.1	1.7	1.9	2.7
1961	2.4	2.6	2.2	2.2	1.7	2.7	1.0	1.6	3.0	2.2	2.8	3.1
1962	2.7	2.7	2.3	2.1	1.7	1.0	1.1	1.3	1.7	1.7	2.3	2.6
1963	2.4	2.5	2.8	2.0	1.6	1.5	1.2	1.4	2.6	1.6	2.8	2.6
1964	2.6	2.6	3.8	2.6	1.5	1.2	1.5	1.2	1.9	2.7	2.4	3.0
1965	2.3	3.0	2.4	1.8	1.5	2.1	1.1	1.4	4.1	2.2	2.4	2.4
1966	3.0	4.1	2.5	2.6	2.3	1.4	1.1	1.7	1.7	2.0	2.6	2.7
1967	2.5	2.0	2.8	2.4	2.1	1.2	1.0	1.3	2.1	3.0	2.0	2.5
1968	2.3	2.5	3.7	2.4	2.1	1.2	1.0	1.2	1.8	1.7	2.9	3.0
1969	2.4	3.3	3.3	2.9	1.7	1.3	1.2	2.9	1.8	2.9	2.4	3.3
1970	3.0	3.6	3.5	3.4	1.8	1.8	1.1	1.8	1.8	2.3	2.5	2.3
1971	2.9	3.2	2.3	2.2	2.4	1.4	1.4	1.1	2.3	1.8	2.1	3.1
1972	2.8	2.4	2.8	2.2	2.2	1.9	1.7	1.2	2.1	3.0	2.7	3.1
1973	3.6	3.9	4.7	3.3	3.4	1.1	1.2	1.2	2.5	2.3	3.0	3.8
1974	2.3	3.6	2.2	3.7	2.9	1.8	0.9	1.5	3.3	2.8	2.3	2.8
1975	4.0	2.9	3.3	3.1	1.6	1.7	2.2	2.3	2.9	2.1	2.8	3.3
Measured Max. (1998-99)	2.5	1.3	2.4	2.2	2.4	1.5	1.4	Na*	Na*	Na*	2.1	1.9
WIS Means (over 20 yr)	1.4	1.3	1.3	1.2	0.9	0.8	0.7	0.8	1.1	1.2	1.3	1.4
Measured Means (1998-99)	0.8	0.5	0.7	0.7	0.6	0.6	0.5	Na*	Na*	Na*	0.6	07

* Na = not available.

Table 6
Tidal and meteorologically induced currents

Period	Mean, m/s	Maximum, m/s	Std. Deviation, m/s
December 1998	0.16	0.53	0.08
January 1999	0.19	0.82	0.10
March 1999	0.20	0.60	0.10

OTHER INFORMATION: The position of the barge scows was monitored with Differential Global Positioning System (DGPS) during transit and placement by an automated disposal surveillance system (ADISS) installed and monitored by Science Applications International Corporation of Newport, RI. The system provided an aid to operators for accurate positioning of the barges for placement. The ADISS recorded the draft of the barges to determine the actual time of release of the material from the barge (i.e., at the time of release, the draft of the barge changed quickly). The data will be used for verification of MDFATE.

CONCLUSIONS: At this point, the mound has remained essentially intact. While the climate has been mild during the monitoring period, it is still surprising that the mound has changed little given the fine-grained nature of the material. However, the cohesiveness of the material is significant as suggested by the peaked features in the mound. Laboratory analyses of the material to determine its erodibility and consolidation characteristics are planned, as well as verification simulations using LTFATE. That is, LTFATE will be used to couple the hydrodynamic data with observed bathymetric changes and additional sediment analyses to improve the accuracy of the model for predicting the fate of mixed-sediment dredged material placed nearshore.

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